

REMARKS

Claims 50-58 are pending in the subject application. In the Office Action, claims 50-58 are rejected under both 35 U.S.C. §112, first paragraph, and 35 U.S.C. §102. More specifically with regard to the 35 U.S.C. §102 rejections, Claims 50-58 were rejected under 35 U.S.C. §102(e) as being anticipated by U.S. Patent No. 5,891,522 issued to Olson ("Olson") or by U. S. Patent No. 5,700,518 issued to Lee et al ("Lee") ad. Under 35 U.S.C. § 102(b) as being anticipated by U. S. Patent No. 5,560,839 issued to Bennett et al. ("Bennett") or by U. S. Patent No. 5,415,674 issued to Feisrtritzer et al. ("Feisrtritzer") or by U. S. Patent No. 5,380,408 issued to Svensson ("Svensson") or U. S. Patent Nos. 5,567,526 or 5,236,740 issued to Peters ("Peters").

Applicants herein amend claims 50, 53 and 54 without narrowing the claim scope. A copy of claims 50, 53 and 54 showing the amendments made is attached, wherein additions to the claims are shown underlined, and deletions are shown with a line drawn through the deleted terms. Applicants herein submit the following remarks and arguments to overcome the rejections.

Claim Rejections under 35 U.S.C. §112, first paragraph

Claims 50-58 were rejected under 35 U.S.C. §112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the art that the inventor, at the time the application was filed, was in possession of the claimed invention. The Examiner states that the claims are rejected because support could not be found for the phrase "unetched carbide particles" in independent claim 50.

Applicants have herein replaced the phrase “unetched carbide particles” with “substantially intact hard constituent particles” in claims 50, 53 and 54. The amendments find support in the specification on page 9 in lines 20-24 as well as elsewhere in the specification.

These amendments do not narrow the scope of the claims but more directly reflect the terms as used in the specification to more clearly show the support for the claims.

Claim Rejections under 35 U.S.C. § 102

Claims 50-58 are rejected under 35 U.S.C. § 102 as being anticipated by various issued patents. The Examiner states that the Applicant’s arguments filed on 7-10-02 were fully considered but they are not persuasive, since the Examiner found no support for the limitation of “unetched carbide particles” in the specifications. Applicants have herein amended the claims to overcome the 35 U.S.C. §112, second paragraph issue. Applicants respectfully request reconsideration of the art based rejection since the limitation “substantially intact hard constituent particles” is supported in the the specification as filed. Applicants respectfully submit that the disclosure of the cited patents do not anticipate or render obvious the product claims of the subject application as herein amended.

The claims of the subject application are directed to an article, comprising a composite portion comprising hard constituent particles in a binder, an etched surface region substantially free of eta phase, the etched surface portion comprising substantially intact hard constituent particles and voids between the substantially intact hard constituent particles, wherein the voids extend to the composite portion, and a

wear resistant coating on the etched surface region and disposed in the voids. None of the references cited by the Examiner disclose an article comprising all of the elements of independent claim 50 or claims 51-58 dependent therefrom .

In the Office Action, the pending claims in the subject application are rejected based on seven references, which in the Examiner's opinion anticipate the pending claims under either 35 U.S.C. § 102 (b) or (e). However, "[a] claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Id* at § 2131.

Applicant respectfully submit that these references disclose patently distinct articles and do not disclosed each and every element as set forth in the claim. The references may disclose a substrate and a coating, however, the structure of the articles in the references are different than the claimed article. The articles disclosed in the prior art disclosed different structure to increase the adherence of the coating to the substrate. Applicants herein discuss these structural differences. All citations refer to the prior art reference unless otherwise stated.

U. S. Patent No. 5,891,522 issued to Olson

Olson discloses a process for coating a tungsten carbide base material substrate with CVD diamond film including the carburization and gas-assisted vaporization of cobalt from the surface with simultaneous recrystallization of surface grains of tungsten carbide to change their stoichiometry for improved adherence. See *Abstract*. The disclosure of Olson specifically distinguishes the surface structure of the Olson article from the article claimed in the subject application. As disclosed at column 3, lines 54-56, Olson teaches, "However, unlike techniques which remove the binder

phase to some depth below the exposed WC-Co substrate surface, binder phase removal is done in a way which limits removal to only an area directly exposed to the CVD growth species, herein referred to as the 'free surface.' The phase composition of the WC phase is controlled to maximize the density of direct chemical bonding between the diamond film and the substrate."

The process of Olson is said to "a) vaporize the free surface binder phase, b) induce growth of the WC grains at the free surface, and c) shift the stoichiometry [sic] of the free surface WC phase to a carbon deficient ratio without formation of the of the [sic] brittle eta phase of WC (M_6C , $M_{12}C$)."
See column 4, lines 24 - 31. This process promotes the recrystallization and grain growth of WC at the surface of the substrate. *See column 5, lines 2 - 3.* The recrystallization and grain growth of the WC provides a free surface free of binder in order to enhance the chemical interaction of the CVD coating and the WC. The process of Olson produces a free surface of the substrate "essentially free of the cobalt binder phase."
See column 4, lines 40-41, column 5, lines 52-53 and column 6, 20-21. Analysis of the 'free surface' of the article of the present claims would reveal the presence of cobalt binder and SEM would not indicate surface grain growth of the WC phase since the hard constituent particles are substantially intact.

The claims of the subject application describe voids between the unetched substantially intact hard constituent particles. The voids extend to the composite portion which comprises a binder. Due to the surface evaporation of the binder and the recrystallization of the WC phase to eliminate voids, the product of Olson does not comprise an etched surface region comprising voids between the substantially intact

carbide particles. The disclosure of Olson does not include each and every element as set forth in the claim.

U. S. Patent No. 5,700,518 issued to Lee et al.

Lee discloses a method of producing a coated composite material substrate that comprises first etching of the hard constituent of the composite material by an electrolytic etching process or a liquid chemical etching. *See column 2, lines 45 - 59.* In a cemented carbide object, this method produces a substrate wherein the "carbide phase of the cemented carbide is irregularly etched". *See column 2, lines 62 - 66.* Subsequently, the substrate is further etched "resulting in the removal of the cobalt binder phase". *See column 3, lines 3 - 6.*

As set forth in the claims, the claimed article comprises substantially intact hard constituent particles. The article described in Lee includes a surface wherein the carbide phase, or hard constituent particles, are irregularly etched and, therefore not substantially intact. Therefore, the disclosure of Lee does not include each element and every as set forth in the claim.

U. S. Patent No. 5,560,839 issued to Bennett et al.

Bennett discloses a method of producing a coated composite material substrate that comprises a first etching of the binder material and a second etching to remove the tungsten carbide to a desired depth. *See column 5, lines 21-28.*

As described above, the claimed article of the subject application comprises substantially intact hard constituent particles and voids between the particles in an etched surface portion. The disclosure of Bennett does not comprise substantially intact hard constituent particles in a surface region, in fact, the carbide particles are

purposefully etched to provide voids in the binder and, therefore, the disclosure of Bennett does not include each and every element as set forth in the claim.

U. S. Patent No. 5,415,674 issued to Feisrtritzer et al.

Feisrtritzer discloses a method of producing a coated composite material substrate that comprises creating at the substrate surface, via the presence of dissociated hydrogen, conditions resulting in the thermal evaporation of binder metal. This thermal evaporation of the binder material creates temperatures at the surface of the substrate of "about 3000°C. However, diffusion and phase changes in cemented materials can no longer be neglected from temperatures of 900° and above." See *column 4, lines 38-39*. The high temperature at the surface results in "recrystallizing, in addition to and simultaneously with the evaporation of binder metal, the hard material remaining in the boundary zone whereby the substrate surface is restructured and roughened." See *column 3, lines 18-21*.

The Feisrtritzer thermal process of evaporation and recrystallization results in a "closed, roughened hard material surface structure." See *column 4, lines 25-26*. This surface structure is distinct from the surface structure of the claimed article. The claimed article comprises an etched surface portion comprising voids extending to the composite portion. The article of Feisrtritzer is a closed surface structure of hard material, which does not comprise voids extending to the unetched portion and, therefore, does not include each and every element as set forth in the claim.

U. S. Patent No. 5,380,408 issued to Svensson

Svensson discloses a method of producing a coated composite material substrate that has been processed so that the "cobalt layer on the surface will be

effectively removed whereas the cobalt in the channels between the hard material grains will not be etched away. The binder phase layers between the carbide grains, which are necessary for the strength of the cemented carbide are not affected." See *column 2, lines 39-45*.

The method and resultant product of Svensson produces the opposite result and structure of the claimed article of the subject application. As discussed above, the claimed article of the subject application comprises an etched surface region comprising voids between the substantially intact hard constituent. The product described in Svensson does not include these voids and actually teaches away from creating these voids. See *column 2, lines 43-45*. The claimed article of the present invention comprises a protective coating disposed in the voids. Obviously, if the product of Svensson does not include voids, a protective coating may not be disposed in the voids. The article described in Svensson does not include each and every element as set forth in the claim.

U. S. Patents No. 5,567,526 and 5236,724 issued to Peters et al.

Peters discloses a method of producing a coated composite material substrate that has a surface layer of hard constituent removed and only some of the binder material removed. See *column 3, lines 23-41*. Peters describes a process that is said to increase the adhesion of an applied coating to a composite material substrate by removal of the surface carbide, or hard constituent material. The process of Peters comprises two etching steps. The first etch "removes a small amount of the tungsten carbide at the surface of the substrate while leaving the cobalt binder substantially intact. The substrate is then subjected to a process which removes any residue

remaining on the surface as a result of the performance of the process which removes the tungsten carbide." *See column 2, lines 57-62.* The primary purpose of this process appears to be the etching of the tungsten carbide and removal of the residue of this process. A by-product of the Peters process is the removal of "some" of the binder material. The substrate claimed in the subject application is patently distinct from the substrate produced by the process of Peters. The claimed article of the subject application comprises an etched surface region comprising substantially intact hard constituent particles and voids between the particles. The carbide particles of Peters are etched. The article described in Peters does not include each and every element as set forth in the claim.

CONCLUSION

For the reasons discussed above, the cited references do not describe each and every element of the article of claims 50-58. Accordingly, withdrawal of the rejection under 35 U.S.C. § 102 for each reference and reconsideration of these claims is respectfully requested. Furthermore, it is asserted that based on the clear distinctions between the claims of the subject application and the references set forth above, no reference or combination of references cited by the Examiner suggests the claimed article. Accordingly, it is respectfully submitted that the claims of the subject application cannot be said to be rendered obvious by the teachings of the cited references in any combination. In view of the foregoing amendments, Applicants respectfully submit that the subject application is in condition for allowance. Such action at an early date is respectfully requested. Should the Examiner have any remaining concerns regarding the application's claims, he is requested to contact the undersigned at the telephone

number below so that those concerns may be addressed in an interview with the Examiner.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Patrick J. Viccareo", written over a horizontal line.

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VERSION OF CLAIMS INDICATING AMENDMENTS MADE

50. (Twice Amended) An article, comprising

a composite portion comprising ~~carbide~~ hard constituent particles in a binder;

an etched surface ~~portion~~ region substantially free of eta phase, the etched surface ~~portion~~ region comprising ~~unetched carbides~~ substantially intact hard constituent particles and voids between the substantially intact hard constituent ~~unetched carbide~~ particles, wherein the voids extend to the composite portion; and

a wear resistant coating on the etched surface ~~portion~~ region and disposed in the voids.

- 53. (Amended) The article of claim 50, wherein the ~~carbide~~ hard constituent particles comprise one or more material selected form the group consisting of:

a carbide material selected from the group consisting of tungsten carbide, titanium carbide, tantalum carbide, niobium carbide, vanadium carbide, chromium carbide, molybdenum carbide, and iron carbide;

a carbonitride of a refractory metal;

a nitride of a refractory metal;

a carbonitride of an element selected from the group consisting of W, Ti, Ta, Nb, V, Cr, Mo, and Fe;

an oxide of an element selected from the group consisting of aluminum, zirconium, and magnesium;

a boride of an element selected from the group consisting of aluminum, zirconium, and magnesium;

a material comprising molybdenum; and

a material comprising tungsten.

54. (Amended) The article of claim 50, wherein the ~~carbide~~ hard constituent particles comprise tungsten carbide and the binder comprises cobalt.